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STATUS REPORT ON SATELLITE METEOROLOGY STUDIES

1 February 1965 - 30 April 1965

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The RAND Corporation
SANTA MONICA • CALIFORNIA

STATUS REPORT ON SATELLITE METEOROLOGY STUDIES

1 February 1965 - 30 April 1965

(Principal Investigator: Y. H. Katz)

RAND work under Contract NASr-21(07) comprises basic studies relating to the scientific utilization of meteorological data that may be obtained from both manned and unmanned satellites and the implications of new techniques and measurements to the development of the science of meteorology.

DESCRIPTION OF PROGRESS

1. The possibility of observing thunderstorms by radio observations from a satellite has been discussed previously in RM-4417-NASA. It was shown that the properties of the ionosphere could be used to limit the field of view without using a directional antenna on the satellite and without requiring a controlled satellite orientation. However, the use of ionospheric properties in this manner induces inaccuracies, one of which follows from the fact that a ray passing through the ionosphere becomes bent and thus may not give the satellite a true indication of the location of its source. The extent and seriousness of this inaccuracy is presently being investigated.

2. At the request of the NASA Contract monitor we examined the meteorological usefulness of a manned satellite and developed a rationale for selecting suitable manned meteorological missions. The results, reported in RM-4462-NASA, were transmitted to NASA Headquarters.

3. The study of the circulation on Mars involves modification of the two-layer primitive equation model that was developed for the study of the earth's general circulation. Using available observational data, a study of the thermal properties of Mars was undertaken, to establish parameters needed for the extensive numerical calculations of the general circulation that are to follow. The results of this study, reported in RM-4551-NASA, were forwarded to NASA Headquarters.

FUTURE WORK

The studies noted in Items 1 and 3 above are being continued. In addition, we will be initiating our studies of the inverse problems of radiative transfer with a study of the numerical estimation of derivatives as applied to radiative transfer in spherical shells. This should lay the groundwork for subsequent numerical studies of radiation fields in spherical shells and for the study of inverse problems associated with this geometry. The effects of sphericity may be significant in interpreting satellite radiation measurements, especially for radiation emitted at grazing angles.

Since it will be necessary to predict when certain areas of the earth's surface will be deficient in balloons from the proposed Global Horizontal Sounding System, our efforts will be directed towards the development of a statistical basis for determining those regions that may expect to have high balloon loss rates. Since the upper-level airflow in the tropics is not sufficiently well-modeled by present-day techniques, we plan to investigate some simplified flow patterns that may prove useful in interpreting balloon movements over these regions.

TECHNICAL REPORTS

The following technical reports were transmitted to NASA Headquarters during this quarter:

1. RM-4462-NASA, Some Comments on the Meteorological Usefulness of a Manned Satellite, S. M. Greenfield, M. H. Davis, D. Deirmendjian, Y. H. Katz, C. Leovy, and R. R. Rapp, February 1965.
2. RM-4551-NASA, Note on Thermal Properties of Mars, C. Leovy, April 1965.

PERSONNEL

The following scientific personnel were active during this quarterly period: K. J. K. Buettner (Consultant), M. H. Davis, D. Deirmendjian, S. M. Greenfield, Y. H. Katz, R. L. Kirkwood, C. Leovy, R. R. Rapp.